FOSTERING PLACE-BASED EDUCATION AND INCLUSION IN THE CLASSROOM THROUGH SCHOOL GARDENS

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A Project Report Submitted in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC HEALTH

in Public Health Practice

University of Alaska Anchorage

August 2020

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Abstract

Place-based education expands the space where students learn by connecting to the outdoors, such as garden-based lessons that are dynamic and have a multidisciplinary curriculum. Students are given the opportunity to learn healthy behaviors, environmentally sustainable practices, and life skills. Inclusion is fostered by giving teachers and students agency in the learning experience. The purpose of this study was to view garden education through the lens of place-based education, critical pedagogy, and social justice. To this end, a lesson plan template was created to facilitate future development of garden-based lessons characterized by responsive curriculum and alignment with academic standards. A university internship course was visualized to support the collaborative effort of school garden programs.

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Chapter 1: Introduction

The great expanse of Alaska creates diverse settings in which people live. Distinct landscapes, harsh climates, and a limited road system lead to variable access to basic needs such as health care and supplies. For many, food security is a growing concern and food sovereignty a faint realization. Subsistence living and recreational hunting and fishing are still familial and familiar, but social norms in rural communities are changing due to 1) disruptions in the transfer of subsistence living skills, 2) continued shifts toward a Western diet, 3) increased capital for fuel and maintenance of equipment used for fishing and hunting, and 4) high food prices as a result of transportation costs (Gregory et al., 2005; Lougheed, 2010; White et al., 2007). The latter is also applicable to urban populations with additional challenges relevant to both rural and urban populations that include 1) parental income and employment, 2) availability of food assistance programs, and 3) diverse food sources including snacks, street foods, and animal products (E. Hodges Snyder, personal communication, September 6, 2019).

In both rural and urban Alaskan communities, food sources and cost have an impact on food security (Alaska Food Policy Council, 2012; Loring & Gerlach, 2009). The concept of food miles describes the distance that food travels from producer to consumer; however, it can also capture the distant connection between Alaskans and the origin of their food. While the infrastructure and climate solutions to food security problems are seemingly faraway, a smaller step is to let smaller hands experience closeness to food.

A child's formative years largely take place in schools, which in turn become a

critical setting for cognitive, social, and emotional development. Education occurs within rooms and hallways, with outdoor space stretching the boundaries of learning spaces. Activity in the open air can contribute to the physical health and health behaviors of children. Lower obesity rates are present in children with adequate school play space (Spruijt-Metz, 2011). Combining educational and spatial opportunities, school gardens are a modality that can serve as a holistic approach to cognitive, corporal, and collaborative child development (Alaimo et al., 2016; Davis et al., 2015).

Chapter 2: Background

2.1 History of School Gardens

The Food and Agricultural Organization (FAO) of the United Nations defines school gardens as “cultivated areas around or near primary schools, which can be used mainly for learning purposes but could also generate some food and income for the school” (as cited in Huys et al., 2017, p. 2). The definition of school gardens may have been shaped by modern sense and society, but the origin of school gardening has been part of history since the 17th century when John Amos Comenius, considered by some as the father of modern education, recognized the role of school gardens as a way to teach and connect students with nature (Gardner Burt, 2016). Not long after Comenius’ claim and then throughout time, philosophers and educators around the world saw the value of school gardens as a tool to educate children about nature. In 19th century Europe, the acceptance and popularity of school gardens grew, with some countries like Austria mandating that all schools have gardens (Gardner Burt, 2016). Educators in the United States were not far behind in this school of thought; progressive thinkers like John Dewey proposed the benefits of academic instruction in a traditional classroom

setting paired with learning experience in a garden (Gardner Burt, 2016).

Garden education was viewed as a platform for a multidisciplinary curriculum—a way to teach fundamental subjects like reading and math while also providing development of civic pride in students (Gardner Burt, 2016). In turn, school gardens became one model for supporting and measuring academic performance, and progressive educators made a further connection to the role of gardens in fostering creativity and interpersonal skills. The value of garden education was recognized by the United States government when it supported further development and expansion of school gardens (United States Department of Agriculture [USDA], 2017, para. 2). Even when there was no support from governmental institutions, the collaboration between schools and community-based organizations became a stronghold for school gardens (Gardner Burt, 2016).

School gardens grew in mass popularity during World War I and World War II when school gardens were promoted as a way to practice patriotism through the growing of food in “liberty gardens” and “victory gardens” (Gardner Burt, 2016). 4-H Clubs were established in every state and President Woodrow Wilson allotted defense funds to formalize agricultural education through cooperative education services with land grant universities (Gardner Burt, 2016). School gardens and education, in general, experienced the ebb and flow of social and political climates through new decades. From wartime propaganda grew school gardens that have evolved to become deeply rooted community spaces supported by grassroots activism, receiving federal grants, administered according to various policies, and developed as a response to local priorities and landscapes. In the northern hemisphere, garden-based education has

been used as a vehicle for experiential learning related to health, nutrition, environmental sustainability, and academic curriculum (FAO, 2010). In the southern hemisphere, the educational use of school gardens is framed as vocational agricultural training or to supplement food consumption and production (FAO, 2010).

2.2 Current Status of School Gardens

The USDA is a prominent supporter of school gardens by providing funding, resources, and guidance to stakeholders. According to the 2015 USDA Farm to School Census, there are over 7,000 school gardens across the nation (USDA, 2017 para. 2). The growth of school gardens and the availability of garden education over time is evident, however, it is not without disagreement. The current educational climate of standardized test scores is not upheld by school garden programs. While outdoor classrooms can be viewed as a means to enhance the student learning experience, the educational sector prioritizes core academics and academic standards above gardening (Gardner Burt, 2016). This force to create alignment between a structured framework and the more freeform environment of school gardens has created issues of curriculum integration (FAO, 2010).

There are opposers who claim the proliferation of school gardens is a product of an unbounded educational fad that allows “curriculum hijacking” (Flanagan, 2010). Other opposers take the stance of school gardens alienating students, particularly African American and Hispanic students, who are in schools focused on academic achievement through test scores, all the while patronizing underachieving students who are helped by a team of volunteers that connect their positive academic performance to a school garden (Flanagan, 2010). In California where school gardens are critically

lauded and infrastructurally supported, the immigrant population is alienated when academic learning is presented as a form of physical labor and family volunteers need to be proficient in English (Flanagan, 2010). Cairns (2018) posits that school garden programs are highly focused on personal transformation and individualistic outputs of academic performance and healthy behavior.

Despite the opposition, the growth of school gardens can be credited with fostering a connection between children and the source of their food by creating hands-on interdisciplinary classrooms (USDA, 2017 para. 1). There is research to support vegetables have a positive effect on children's health, growing and preparing food from a school garden can increase preference for healthy fruit and vegetables, gardening activities can create positive attitudes toward the environment, and hands-on learning improves student engagement (FAO, 2010). Furthermore, garden education can be positioned to create a space for discussion and connection to political and social issues as well as health outcomes.

2.3 Health Domains

Federal and state governments are implementing numerous health programs that promote physical activity and nutrition. For example, the Alaska Department of Health and Social Services implements various health promotion campaigns such as *Play Every Day* and *Alaskans Taking on Childhood Obesity*. As these programs have shown, designing interventions for school-aged children can be complex because environmental factors—particularly at structural levels such as households and schools—are often outside the control of the child (Spruijt-Metz, 2011). Consequently, there is a need to design effective school-based initiatives that target health promotion,

and programs like school gardens have been shown to positively impact physical activity, nutrition, and social support (Davis, Spaniol, & Somerset, 2015).

2.31 Physical Activity

In Alaska, 31% of Alaska high school students are classified as either overweight (18%) or obese (14%)—well above the Healthy Alaskans 2020 targets of 12% for overweight and 10% for obesity (Alaska Obesity Prevention and Control Program, 2018). Furthermore, 17% of K-8th grade students are overweight and another 18% are obese in the Anchorage and Matanuska-Susitna school districts (Alaska Obesity Prevention and Control Program, 2018). This highlights the need for promoting physical activity and providing various outlets to reduce overweight and obesity rates in children. Outdoor space is critical in this effort. For example, according to Spruijt-Metz (2011), living within half a mile of a public park increases adolescent girls' physical activity significantly.

Gardening is a way for students to get fresh air, but it also provides a form of aerobic exercise through planting, caring for and harvesting plants. School gardens lead to increased physical activity during the school day through varied postures and movements and less sitting than indoor, classroom-based lessons (Wells, Myers, & Henderson, 2014). Ozer (2007) conceptualized the proximal (short-term) and distal (long-term) effects of school gardens on students. With gardening sites and activities that are supported by hands-on curriculum, there is a proposed distal effect of a decreased risk for obesity and chronic disease (Ozer, 2007). There is a growing body of research that supports the position of school gardens to promote children's physical activity. Wells, Myers, and Henderson (2014) conducted a 2-year study which indicated

that compared to children at schools without gardens, children at garden intervention schools report a greater reduction in their usual daily sedentary activity.

2.32 Nutrition

When it comes to eating, children and adolescents have limited opportunity to practice responsibility and choice because schools and parents determine the structure of the food environment. A report by the Alaska Department of Health and Social Services (2017) found that 90% of high school students are eating less than the recommended daily servings of fruit and vegetables. Fruit and vegetable consumption among primary school-aged children was not referenced in the report, but 3-year olds living in the Northern and Southwest regions of the state are significantly more likely than those living in other regions to drink any soda on a given day (Alaska Department of Health and Social Services [ADHSS], 2017). Overall, according to the Centers for Disease Control and Prevention (CDC), most children do not meet the national recommendations for fruit and vegetable servings (State Indicator Report on Fruits and Vegetables, 2018). In consequence, there is a dire need to teach children about healthy dietary behaviors and provide them with tools for healthy decision-making.

School gardens have been linked to improved dietary intake and behaviors in children (Berezowitz, Yoder, and Schoellerm, 2015). Spending as little as 30 minutes a day in a garden, children have shown better vegetable and fruit identification, recognition of healthier snack choices, and increased willingness to taste vegetables and fruits (Davis et al., 2015). With school garden programs that had a culinary component, children were found to have improved self-efficacy skills in the preparation and cooking of vegetables and fruit (Davis et al., 2015).

Ozer (2007) concluded that there are both proximal and distal effects in the form of increased exposure to fresh produce and positive attitudes towards fresh produce (proximal) as well as improved nutrition knowledge and understanding of dietary quality (distal). In summary, school gardens have been shown to improve health behaviors related to: 1) preference for, 2) attitudes towards, 3) willingness to taste, 4) identification and knowledge of, and 5) self-efficacy in consuming a variety of vegetables and fruits (Davis et al., 2015). Finally, school gardening programs have also led to parental outcomes with regard to improved dietary behaviors (Gibbs et al., 2013). Ozer (2007) conceptualized both the proximal and distal effects of school gardening programs on parental knowledge of nutrition and improved family dietary choices. These family-level impacts include parental participation with gardening assignments, changes in home eating behaviors to support healthy choices, and information sharing about nutrition, food systems, and resource conservation (Ozer, 2007).

2.33 Social Support

Research has found that a childhood obesity intervention program is more effective if it is comprised of family members, teachers, physicians and allied health professionals (Pronk & Boucher, 1999). This group of individuals is considered the unit of social support with an overall purpose of providing all four types of supportive roles: emotional, instrumental, informational, and appraisal (McLeroy et al., 1988). The premise is that by expanding social support, the child will be provided with the resources to change the two major obesity-related behaviors of dietary intake and physical activity. By involving critical parties in health management, the individual receives reinforcement and support from various people. This co-op approach should

be a cornerstone in gardening curricula.

Community and school gardens—forms of green physical activity—have been associated with positive psychological and social health behaviors (Chawla et al., 2014; Davis et al., 2015; Yeh et al. 2016). Gardening can positively impact "self-fulfillment, life satisfaction, sense of belonging and community contribution" in students and beyond (Blair, Giesecke, and Sherman, 1991). The proximal and distal effects of school gardens involve all stakeholders: students, school, family, and community. Through peer relationships, cooperative instruction, parent involvement and community networks, a child's social support unit is strengthened at various levels (Ozer, 2007).

2.4 Learning Domains

School gardens allow experiential learning that is mixed with social learning and life skills. Students can develop a greater sense of connection to the school and be better positioned to achieve academic success and engagement. The impact of garden programs improving or at least not reducing academic test scores has been explored in prior studies (Berezowitz et al., 2015). Prior research suggests that school gardening programs can contribute to pro-academic behaviors such as time on task, classroom behavior, creativity, and attitudes toward learning (Berezowitz et al., 2015).

The steady increase in the number of school gardens is matched by a research gradient that shows support for them as an arena for learning that complements and enriches curriculum (Passy, 2014). School gardens provide a context for teaching and learning that can in part be shaped independently from the existing school culture. It has the potential to find a balance between prescriptive education systems, academic freedom, and learner autonomy. This is partly achieved by going beyond curriculum

requirements and finding creative ways for teachers and students to actively participate in the learning experience. Previous research has shown school gardens provide an arena for different types of learning (Berezowitz et al., 2015; Hazzard et al., 2011; Passy, 2014). Dillon and colleagues (2005) found that outdoor garden experiences can be compared to an educational framework that is inclusive of learning types related to cognitive, affective, behavioral and physical, and interpersonal and social. Students are able to show a connection to one or more of each learning theme when participating in garden-related activities (Morris, O'Donnell, Reid, Rickinson, & Scott, 2005).

2.41 Cognitive Learning Domain

The cognitive learning domain describes the acquisition and understanding of knowledge (Passy, 2014). With school gardens, the cognitive domain is represented through learning about nature, learning about nature-society interactions, learning new skills and practical conservation (Dillon et al., 2005). The curriculum can encompass science topics such as habitats or interactions like farming practices (Dillon et al., 2005). A number of authors have suggested that “the value of using the outdoor classroom was often seen as less to do with individual curriculum topics than to do with the ability of the setting or the activity to convey the interconnectedness of the environment and man’s relationship to it” (Dillon et al., 2005, p. 23). The cognitive domain can be expressed in how students use technical terms and relate scientific information while relating to their own experiences.

2.42 Affective Learning Domain

The affective learning domain is the development of student attitudes, values, beliefs and self-perceptions (Passy, 2014). This encompasses learning that is more

challenging to capture in the curriculum as it relies on connections between experiences, knowledge, and values. Dillon and colleagues (2005) concluded that gains in one dimension (e.g., food-farm links) reinforced gains in other dimensions (e.g., sustainable living).

2.43 Behavioral and Physical Learning Domain

The behavioral and physical learning domain relates to personal behaviors and physical fitness (Passy, 2014). Environmental action is one way for students to express the behavioral component of this learning domain, whereas physical skills are learned through planting, caring for and harvesting plants. Dillon and colleagues (2005) describe the outdoors as a way for students to learn about nature-society interactions (e.g., where to build the school garden), learning about nature (e.g., weather) and learning about oneself (e.g., confidence to care for plants).

2.44 Interpersonal and Social Learning Domain

The interpersonal and social learning domain includes communication skills, teamwork, and leadership. Gardening activities can lead to a greater sense of freedom and encouragement and “were also thought to be helping to increase students’ confidence and self-esteem” (Dillon et al., 2005, p. 29). This can have a positive impact on academic performance in that a feeling of self-assurance positions students to be effective learners. Social skills are developed through school gardens by giving students an opportunity to meet new people, with different teaching styles, and also be involved in activities which require cooperation and teamwork (Dillon et al., 2005, p. 29).

2.5 Gardening Curriculum

A number of researchers have recognized the impact of the interdisciplinary

approach of gardening programs to support academic performance in various subject areas, particularly science (Berezowitz et al., 2015). This is achieved through an educational strategy that utilizes school gardens to reinforce fundamental principles from a variety of disciplines. The gardening curriculum allows for the integration of multiple subject areas which spans the natural sciences, social sciences, mathematics, nutrition, language, and art. These subject areas are directly linked to health education through garden activities. Using a school garden for academic instruction can often take the form of standards-based curriculum and teacher-created lesson plans. A standards-based curriculum can be obtained from a university, school garden network or agriculturally based education foundation. Teacher-created lesson plans can be collaboratively created by teachers and garden coordinators, parents or community volunteers (Hazzard et al., 2011).

One excellent example of a standards-based curriculum created by a university comes from the University of California Davis Center for Nutrition in Schools, which has developed an innovative curriculum called “Nutrition to Grow On”, comprised of nine lessons that are designed to teach children in grades 4-6 and their families about nutrition by relating each lesson to a garden activity. Lessons are designed around nutrition and gardening, nutrients and food groups, food math and labels, physical activity, and healthy snacks. Consumerism and goal setting are also covered in later lessons.

The FAO (2010) identifies core subjects for school gardens, which include nutrition education, science, business studies, agriculture, and environmental studies. Lesson plans can be created around the subject areas as suggested by the FAO;

however, the learning agenda core should teach children how to:

- cultivate food successfully;
- respect the environment in direct practice (e.g., conserving water, replacing trees);
- see the bond between gardening and good nutrition, and learn to grow a healthy diet;
- value fresh vegetables, fruits and legumes, including indigenous foods;
- store and preserve foods and prepare them safely;
- appreciate the links between diet and health;
- apply concepts of good diet and healthy lifestyle to one's own practices;
- resist junk food;
- market and sell food;
- explain and demonstrate one's learning and understanding to others (FAO, 2010, p. 12)

The dynamic nature of a school garden curriculum—from creation to content—is a benefit that allows lesson plans to be unique to school culture and responsive to the needs of students and teachers. Subject areas vary from school to school, with some programs collectively using the garden to teach science, mathematics, and visual and performing arts (Hazzard et al., 2011). For this reason, lesson plans for school gardens do not have a singular model for curriculum, learning objectives and outcomes.

2.6 Learning Assessment Cycle

The Learning Assessment Cycle (LAC) "is a process for organizing student assignments and activities, where the main goal is to lead students through each of the

three spheres of the Information Fluency Triad and then (this is the important part) allow them to revise their understanding of concepts or revise their skill sets based on your assessment and feedback [Figure 1]" (Lott, n.d., para. 1).

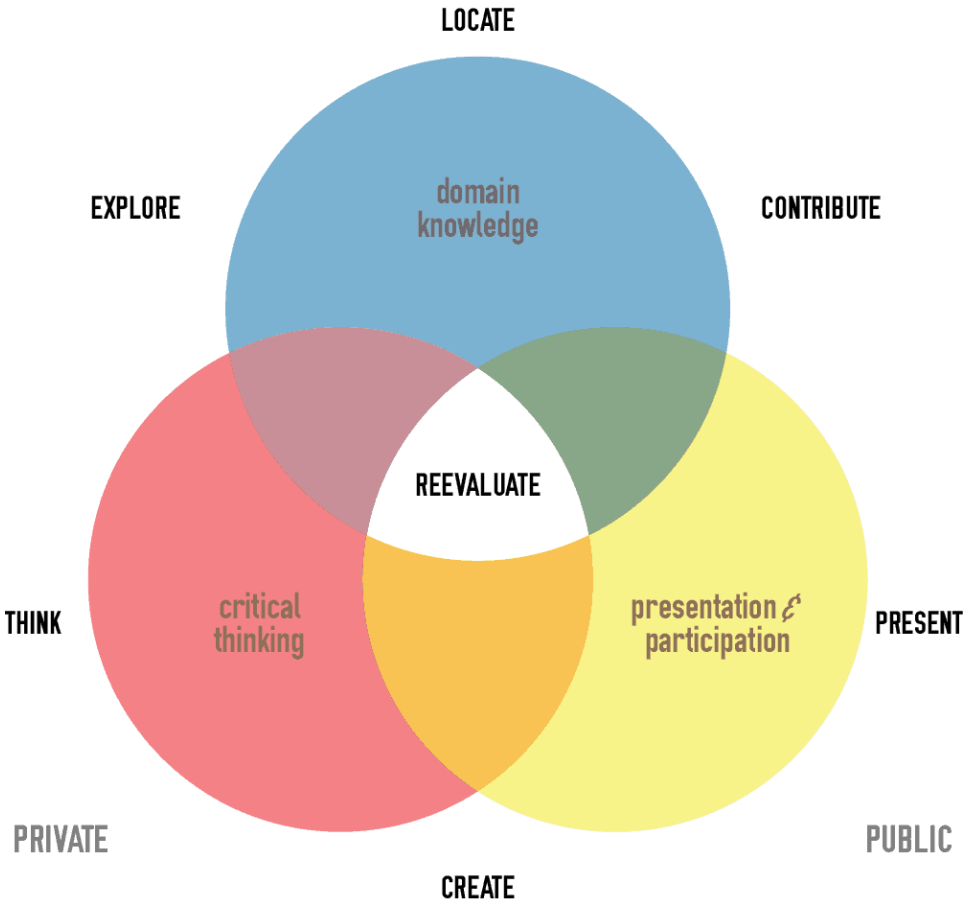


Figure 1. The Learning Assessment Cycle with three areas of information fluency (Courtesy of C. Lott)

In curriculum design, the LAC can "act as a map for organizing a course's structure so that students complete a cycle at least once in a course" (Lott, n.d., para. 1). The information fluency triad is composed of three areas: domain knowledge, critical thinking, and presentation and participation. These "three components of learning that work together to develop and confirm students' understanding of the subject of your course" (Lott, n.d., para. 1). The LAC can serve as an essential supporting structure to

guide curriculum development. Lessons can be evaluated based on how content fits within each domain, with the overall objective of students displaying practice, mastery and communication.

Chapter 3: Project Framework

3.1 Place-Based Education

The concept of place-based education (PBE) has a history that predates school gardens. The term and definition is shaped by modern research and practice, but its origin can be traced back to John Dewey who in the late 19th century advocated for educational philosophies that in today's times have become the foundation of PBE. In 1897, Dewey expressed his belief that education and the experience of living were not separate, "… education, therefore, is a process of living and not a preparation for future living" (Deringer, 2017, p. 335). Place-based education has become a foundational educational theory with the research of thinkers like Paulo Freire, Gregory Smith, David Sobel, and David Gruenewald (Deringer, 2017). It is perhaps Gruenewald who best captures the evolution of PBE in shaping current educational and societal norms: "place-conscious education, therefore, aims to work against the isolation of schooling's discourses and practices from the living world outside the increasingly placeless institution of schooling" (Gruenewald, 2003, p. 620).

The structure and application of PBE is as diverse as gardening curricula, in that it adapts to different places, people, and programs. Moreover, similar to a gardening curriculum, PBE has core themes that are integrated throughout its implementation: 1) cultural studies, 2) nature studies, 3) real-world problem solving, 4) internships and entrepreneurial opportunities, and 5) induction into community processes (as cited in

Deringer, 2017, p. 335). The similarities of PBE and gardening curricula further expand in the multidisciplinary approach to teaching subject areas, which is captured in one definition of PBE: “Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and other subjects across the curriculum” (Sobel, 2005, p. 335). Previous studies have emphasized PBE as a hands-on, real-world learning experience that strengthens connections between students and academic achievement, community engagement, environmental sustainability, and civic action (Sobel, 2005).

3.2 Critical Pedagogy

Critical pedagogy is a central theme for many PBE programs, and is one of the foundations on which PBE theory has been built (Deringer, 2017). Seminal contributions have been made by David Gruenewald in establishing PBE’s connection to critical pedagogy. PBE and critical pedagogy are mutually supportive in that the latter is primarily concerned with the power structures surrounding education (Deringer, 2017). Critical pedagogy “examines schooling in historical and social contexts, in terms of class divisions, and in terms of the capitalist society in which it exists in America” (Deringer, 2017, p. 339). In essence, it challenges the homogenization of education through standards and policies, and “questions assumptions of the educational system and rejects a blanket value system that empowers some and marginalizes others” (Deringer, 2017, p. 337).

Critical pedagogy is fundamentally rooted in disrupting the status quo and diversifying education in terms of schooling, stakeholders, and systems (Deringer, 2017). Efforts are represented by school gardens which have the capacity to create a

degree of balance between the grassroots-like existence of gardening programs with the structural controls of educational systems and funding sources. Critical pedagogy recognizes the necessity of giving teachers and students agency as well as expanding their learning experiences. The author of this project report asserts that teachers and students need to become part of a community that is not marginalized by academics or economics (critical pedagogy), who have a learning space that is outside and connected (PBE), and are given the opportunity to study health and environment (gardening curriculum). To this end, it is evident that school gardens are at the intersection of PBE and critical pedagogy, moving both forward one small footstep at a time.

Chapter 4: Project Goals and Objectives

The overarching project goal is to support school gardening programs by creating grades 3-5 lesson plans guided by the LAC and founded in pedagogy. To connect the project to PBE, consideration and effort will be given to defining “place”. At first glance, Alaska may not seem like an obvious setting to explore an initiative of PBE which is fundamentally rooted in localized and distinctive principles and practice. Alaska has immensity in size and diversity in communities, so a focused effort such as PBE may seem to be limited in adaptability and scalability. However, PBE encourages:

- Learning that focuses on local themes, systems, and content;
- Learning experiences that contribute to the community’s vitality and environmental quality and support the community’s role in fostering global environmental quality;
- Local learning that serves as the foundation for understanding and participating appropriately in regional and global issues;

- Learning experiences that are tailored to the local audience;
- Learning that is personally relevant to the learner.

(Place-Based Education Evaluation Collaborative, n.d.)

Alaska has an awareness of its people and places, of its traditions and trajectory. This sense and acceptance of distinctiveness lends itself to PBE, where place is variable and defined by community.

In addition to the active role of teachers and students in school gardening programs, there is potential to collaborate with college students who become ambassadors of health and education. The intended outcome is to create enriching school garden lesson plans that encourage civic engagement as well as develop an inclusive space for teachers, students, and volunteers (Hazzard et al., 2011). A secondary project goal is to lay the groundwork for creating a connection between university and local schools in support of a student-to-student learning model. The School and Garden Workshop Course with the University of Arizona will serve as a model program for exploring this project goal. This workshop-based course is designed to enable undergraduate and graduate students to work in local schools helping students and teachers to implement a school garden program — from constructing garden beds to developing curriculum to harvesting vegetables. Critical topics such as food production, food histories, and food politics are also at the core of workshop course.

The “Nutrition to Grow On” lesson plans will serve as one model curriculum for exploring the project goal. The comparison of “Nutrition to Grown On” and other curriculum will have the following review objectives.

1) Compare available curricula from a collection of resources from universities, school garden networks and agriculturally based education foundations to characterize core themes of gardening programs.
2) Distinguish thematic content by selecting core themes for connection to learning standards and delivery.
3) Develop gardening lesson plans that are comprised of a multidisciplinary curriculum and which reinforces the connections between learning domains and Place-Based Education (PBE) in Alaska.
4) Design a university course syllabus to support a student-to-student teaching model.

Chapter 5: Methods

5.1 Study Design

The project utilized descriptive research, which is a common method in social science and educational research. Previous studies have emphasized the contribution of descriptive research to explore "*what is* essential to successful education research and effective policy and practice..." (Loeb et al., 2017, para. 1). Furthermore, "descriptive analysis characterizes the world or a phenomenon—answering questions about who, what, where, when, and to what extent. Whether the goal is to identify and describe trends and variation in populations, create new measures of key phenomena, or describe samples in studies aimed at identifying causal effects, description plays a critical role in the scientific process in general and education research in particular" (Loeb et al., 2017, para. 1).

Descriptive research design was deemed responsive to the project because the

goals have to do with describing what gardening curricula already exist, and observing how thematic content can be applied to the design of new lesson plans that integrate PBE and critical pedagogy. Project objectives did not attempt to establish causal relationships between resources that already exist, which would be complex due to the varied modalities by where gardening curricula are presented. It is a descriptive research design that allowed the gathering of thematic content between resources created by university, school garden networks, and agriculturally-based education foundations. Furthermore, a descriptive methodology supported the research effort of identifying specific state- or national-achievement standards or learning objectives that may be linked to gardening curricula.

The data collected through descriptive research was qualitative and used to describe categories of information or patterns of content. Data were organized into emerging patterns or classified based on subject areas (e.g., nutrition and mathematics) and connection to education standards (e.g., Common Core Standards and Next Generation Science Standards).

5.2 Literature Review

A comprehensive literature review was conducted starting April 1, 2019 with an end-date commencing on February 21, 2020. A systematic screening of literature was performed using a variety of databases including Academic Search Premier, AGRICOLA, ERIC, and Google Scholar. RefWorks was used as a repository for journal articles which were tagged with keywords and grouped by subfolders based on thematic content. The literature review created a baseline collection of narrative data that captured recurring subject areas and thematic content. Examining previous studies also

lead to sample gardening curricula which were embedded in the studies and reviewed by the researchers. Such serendipitous discoveries thereby served as a starting point for this project by allowing compilation of a collection of lesson plans from school garden networks and agriculturally-based education foundations. A methodological screening was used to inform the appraisal of articles and curriculum for quality and relevancy. The literature review was guided by the following inclusion criteria.

- Review type: narrative
- Date: 2009-current
- Type of Publications: original studies and systematic review
- Keywords: school gardens, best practices, school wellness, child nutrition, nutrition education, environment education, garden framework, school garden implementation, gardening curriculum, nutrition curriculum, teaching, learning, fruit intake, vegetable intake, primary/elementary school, education standards/policies, school health/wellness, school gardens best practices, place-based education, and critical pedagogy

5.3 Curriculum Review

School gardening lesson plans from several universities, school garden networks and agriculturally-based education foundations were compared for core themes. To capture gardening lesson plans with wide representation of structure (i.e., university, school garden network, and agriculturally based education foundation) and authorship (i.e., teachers, garden coordinators, parents, and community volunteers), a general internet search engine was used to locate resources. The broadness of this search produced illimitable results using the search terms school garden curriculum, school

garden lesson plans, and garden-based school lessons. Gardening lesson plans that were free and available as a complete lesson were included in the review. This stage of the research was not dependent on a research database (e.g., Academic Search Premier) because peer-reviewed journal articles would likely not include complete lesson plans, which was necessary for review of content areas. Nonetheless, when a specific gardening lesson plan was referenced in a journal article during the literature review phase of this project, attempt was made to locate the complete gardening lesson plans to include in the curriculum comparison. The Common Core Standards and Next Generation Science Standards (NGSS) were noted during screening of resources.

5.4 Project Keystones

GrowU is an Anchorage-based program that connects local schools with education on food systems. The program is active in Williwaw Elementary in Anchorage, Alaska, which is the community partner for this project. The program aims to expand lesson development and partnership with community members and university students. Both objectives are served by this project. GrowU has an existing school gardening curriculum developed by researchers, teachers, and community members. The adoption of this curriculum by Williwaw Elementary allowed for a natural connection to the project objective of developing gardening lesson plans with the foundational principles of multidisciplinary curriculum, learning domains, PBE and academic standards. The lesson plans were reviewed to align current school garden activities with the foundational principles of this project. The revision process honored the original work of the lesson plan contributors and the acceptance of the activities at Williwaw Elementary, but at the same time allowed for an evolution with ties to the novel ideas of

this project. Lastly, the project presents an opportunity for revised lesson plans for review and discussion among stakeholders thereby supporting the iterative process of curriculum development and implementation.

Similar to GrowU, the Edible Schoolyard Project is a school garden and kitchen program that aims “to teach essential life skills and support academic learning” (Edible Schoolyard Project, n.d., para. 6). The program was founded 25 years ago by chef and author Alice Waters. A partnership was established with a public middle school in Berkeley, California to meet the mission of “…transforming the health of children by designing hands-on educational experiences in the garden, kitchen, and cafeteria that connect children to food, nature, and to each other” (The Edible Schoolyard Project, n.d., para. 5). The Edible Schoolyard has a resource library of 62 lesson plans that were created by staff of the project and teachers at King Middle School. The Edible Schoolyard science and humanities curricula were developed and revised using the Edible Schoolyard Curriculum Discussion Tool which provides a comprehensive framework with collaboration, engagement and equity at its core. Furthermore, the Edible Schoolyard Curriculum Discussion Tool allows for the development of curriculum that supports social justice and dismantles oppressive systems (The Edible Schoolyard Project, n.d.). Thus the guiding principles of the Edible Schoolyard Curriculum Discussion Tool matched the essential concepts of the project—PBE and critical pedagogy—and in turn was used to create a lesson plan template and guide the revision of the gardening lesson plans used at Williwaw Elementary.

Chapter 6: Results

6.1 Curriculum Comparison

The curricula of fourteen gardening programs were examined, which represented the program types of interest in this project: universities, school garden networks and agriculturally-based education foundations. The history and mission statement of each program was examined to understand the structure whereby lesson plans were implemented. Individual lesson plans were then reviewed for subject, grade level, background, lesson environment, activity types, student assessments, supplementary information, and other characteristics that may be specific to a program. Based on these areas of review, the uniqueness of each program was evident. Basic content areas that spanned each lesson are included in Table 1. Academic standards were noted based on lesson alignment with state standards, Common Core Standards,[1] and Next Generation Science Standards (NGSS).[2] These standards were created to provide a clear and consistent framework for teachers and were developed by teams composed of educators and school administrators.

[1] The Common Core Standards is a set of K-12 academic standards in mathematics and English Language arts/literacy. The standards are learning goals for students at the end of each grade. They were developed to ensure high school graduates were prepared to enter college and the workforce.

[2] The Next Generation Science Standards (NGSS) are K-12 science standards based on the National Research Council's publication of the *Framework for K-12 Science Education*. The NGSS aims to guide students towards science literacy and workforce preparedness.

Table 1. Summary of school garden lesson plans

Program Name	Grade Levels	Disciplines	Lesson Number	Sample Topics	Content Areas	Academic Standards
Alaska Ag in the Classroom – Fairbanks Soil & Water Conservation District	K-12	Science, social studies, language arts and nutrition	15	Plant processes, soil, seeds greenhouses, animal care, animal products, chemistry	Concept Objectives, Time, Setting, Activities, Materials Needed, Procedure	Alaska Content Standards (Note: Select lessons only)
Community & School Garden Program – University of Arizona	Pre K-12	Science, literature, art, and culture	19	Waste, composting aquaponic system, plant life, desert biomes, germination, water conservation, animals, biodiversity	Unit Summary, Lesson Summaries, Subject, Objective, Enduring Understandings and Essential Questions, Content Objective: Math, Writing, Other, Language Objective, Vocabulary, Materials, Seasonality, Anticipatory Set, Activity/Investigation, Teacher Reflection	Common Core Standards
Cornell Garden-Based Learning – Cornell University College of Agriculture & Life Sciences	2-8	Science, social studies, art	40	Plant observation, creativity in the garden, food systems, salad gardens, youth leadership, produce marketing	Introduction, Overview, Site, Activities, Planting, Harvesting, Budget	New York State Learning Standards (Note: Select lessons only)
Dig in! – USDA	5-6	Science, math, English/language arts, health	10	Plants, food system, nutrition, culinary traditions, cooking, food preservation,	Total Time Required, Lesson Overview, Essential Questions, Key Message, Subject Connections, Learning Objectives, Supplies, Featured Fruits and Vegetables, Additional Foods, Teaching Procedure, Important Food Safety Steps, Dig Deeper	National Academy of Sciences, Common Core Standards, American Cancer Society

Table 1 (continued).

Edible Schoolyard Berkeley	6-8	Science, social studies, health, English/language arts	62	Garden orientation and behavioral expectations, teamwork, seasons, harvesting, decomposition, flower biology, pollinators, climate change, respect in the garden, soil	Place of Learning, Duration, Grade Level, Summary, Student Learning Goals & Objectives, Assessments, Materials & Prep, Procedure Steps, Lesson Materials, Vocabulary, Academic Standards, Edible Schoolyard Standards, Contributors	Common Core Standards
Hidden Villa	Preschool-12	Science	31	Plants, compost, solar energy, microhabitats, renewable resources, animals, water conservation	Video, Discussion, Printable Materials, Standard	NGSS
Indoor Gardening Curriculum – Fairbanks Soil & Water Conservation District	Lesson dependent	Science, engineering, technology	43	Soil, plant growth and processes, hydroponic and aquaponic growing systems, composting, food waste, marketing	Suggested Grade Levels, Time, Core Ideas, Materials Needed, Supplies, Preparation, Background for Teachers, Vocabulary, Procedure (Introduction, Hands-On Learning & Harvesting), adaptations for younger grades and older students, Ending Activity	Alaska Content Standards, NGSS
Great Garden Adventure – USDA	3-4	English/language arts, mathematics science and health	11	Plants, soil, human senses, school cafeteria, family recipes	Overview, Learning Objectives, Time Required, Materials, Teacher Preparation, Standards, Instructional Process, Handout, Garden Detective News, Family Activity, Lesson Extension	Common Core Standards
Growing Minds – Appalachian Sustainable Agriculture Project	Pre K-12	Science, literature, nutrition	50	Agriculture literacy, food systems, cooking, nutrition, non-fiction learning	Goals, Books to Read, Curriculum Alignment, Materials, Activities	North Carolina Essential Standards, Common Core Standards

Table 1 (continued).

Life Lab	K-5	Science, nutrition	24	Plant science, soil, pollinators, garden habitats	Teacher Introduction, Science Standards, Recommended Literature, Materials List, activities	California Science Standards (Note: Lessons developed before NGSS adopted by the state)
Minnesota School Gardens – Minnesota Department of Agriculture	K-12	Science, social studies, language arts, math, and nutrition	31	Plants, photosynthesis, soil, germination, pest management, insects, fertilizers, healthy food, food labels, food safety	Grade, Materials/Preparation, Summary/Overview, Garden Connection, Background Information, Objectives, Procedure, Fun Fact, Summary of Content and Teaching Strategies, Review/Summary, Modifications/Extensions, Teacher Materials, Handout, Assessment	Minnesota Academic Standards
My First Garden – Rodale Institute	Pre K-K	Science, nutrition, arts	5	Plants, food system, nutrition, organic farming	Video Tutorial, Printable Resources, Books to Read, Crafts, Snacks	N/A
Nutrition to Grow On – University of California Davis	4-6	Science, mathematics, language arts, history, environmental studies, nutrition and health	9	Nutrition and gardening, nutrients, food math, food labels, physical activity, healthy snacks, consumerism	Objectives, Applicable Content Standards, Materials for in-class lesson and activities, Materials for gardening activity, Preparation for in-class lesson and activities, Preparation for gardening activity, Nutrition Lesson Activities, Gardening Activity, Additional Activities, Background Information, Handouts (assessments), 10 Tips	California Academic Content Standards (Note: Lessons developed before Common Core Standards and NGSS)
Slow Food USA	K-5	Science, social studies	2	Sensory education, food preferences, cooking, garden skills, plant life cycles	Introduction, Tips for Lesson Planning, Key, Objective, Background, Materials, Preparation, Activity, Discussion, Further Exploration,	N/A

Chapter 7: Discussion

7.1 Academic Standards

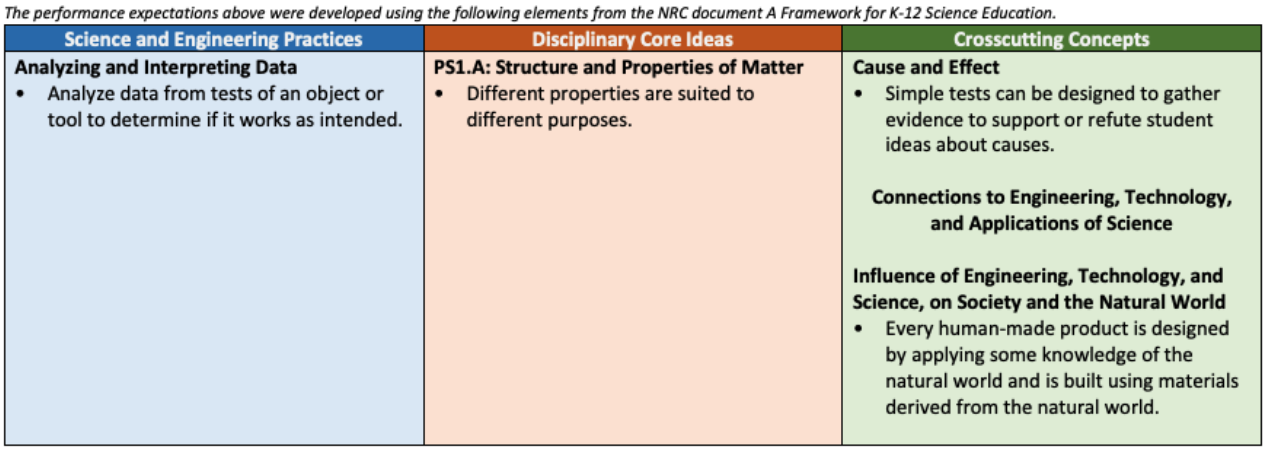
During the review of gardening curricula, academic standards were noted as state- or national-level in the form of state standards, Common Core Standards, Next Generation Science Standards (NGSS), or a combination. Alignment of lesson plans to academic standards was frequent, which supports the importance of standards-based garden lessons. The application of standards were as varied as the curricula itself (e.g., university, school garden networks, and agriculturally-based education foundations). In the sample of garden curricula that were reviewed for this project, no pattern emerged as to which academic standard was prevalent (i.e., state standards versus Common Core Standards). For example, in reviewing the Indoor Gardening Curriculum created by the Fairbanks Soil & Water Conservation District, the lesson plans were aligned with both the Science Standards for Alaska and NGSS. With this discovery and the project objective in mind, it is prudent to review the academic standards in the state of Alaska so that an alignment with the gardening curricula of Williwaw Elementary can be proposed.

7.2 K-12 Science Standards for Alaska

In 2018, the Alaska Department of Education and Early Development created a committee of principals, curriculum directors, science specialists, and other qualified individuals to serve as writers and reviewers and aid in the creation of new science standards for the state of Alaska (Alaska Department of Education and Early Development, n.d.). The committee decided to use the Next Generation Science Standards (NGSS) as a basis for Science Standards for Alaska “due to its three-

dimensional design, and focus on science for all students. The three-dimensional design provides students with a context for the content of science, how science knowledge is acquired and understood, and how the individual sciences are connected through concepts that have universal meaning across disciplines" (Alaska Department of Education and Early Development, n.d., p. 4).

As a result the Science Standards for Alaska are largely the same as the NGSS, with the committee not changing the NGSS scientific content and kept revisions to adding examples of skills and principles in an Alaskan context, rephrasing several NGSS content standards for clarity, and rearranging a limited number of NGSS content standards grade level (Alaska Department of Education and Early Development, n.d.). The resulting science standards are categorized by performance expectations which sets how students will demonstrate understanding. Within each performance expectation are three categories: 1) science and engineering practices, 2) disciplinary core ideas, and 3) crosscutting concepts (Figure 2).



The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended.	**PS1.A: Structure and Properties of Matter** • Different properties are suited to different purposes.	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. **Connections to Engineering, Technology, and Applications of Science** **Influence of Engineering, Technology, and Science, on Society and the Natural World** • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

Figure 2. An example of standard architecture from the Science Standards for Alaska (Courtesy of Alaska Department of Education and Early Development)

7.3 Connection to Other Subject Areas

While gardening programs have been found to support academic performance in science, it also contributes to learning in other subject areas (Berezowitz et al., 2015). This is achieved through integration of multiple disciplines such as social sciences, mathematics, nutrition, language, and art. Within the Science Standards for Alaska are cross-disciplinary performance expectations that are rooted in math, literacy and cultural standards. Specifically, the Science Standards of Alaska are connected to math through use of quantitative skills in scientific experiments, to literacy through construction of reasoning and theories, and to cultural standards through connection to Alaska-based place and history (Alaska Department of Education and Early Development, n.d.). To this end, aligning the gardening curricula of Williwaw Elementary to the Science Standards of Alaska creates connections to other subjects and strengthens hands-on interdisciplinary classrooms.

7.4 Williwaw Elementary School Garden Program

The Williwaw Elementary program is part of an initiative to develop garden-based curriculum for Alaska schools. Garden lessons are structured as monthly, hands-on gardening and nutrition lessons. The capstone is a school garden for use during summer months. The program utilizes the GrowU school gardening curriculum, which is comprised of eleven lessons. Each lesson is categorized by subject/course, grade, topic and lesson length. The lessons cover introduction/objectives, learning goals, vocabulary, expectations, materials, instructions, extension idea, community engagement and resources. The content and activities of each lesson plan were reviewed to propose a connection to the Science Standards of Alaska in Table 2.

Table 2. Williwaw Elementary garden lessons with proposed Science Standards of Alaska

Lesson Name	Grade Levels	Learning Goals	Activities	Science Standards
Texture in the Garden	3-5	Identify living and nonliving organisms, explain how nonliving organisms help plants grow, create visual art of textures in the natural world	Collect items with different textures from the garden, consider how to categorize items, discuss soil, seeds and plants as living or nonliving	3-LS4-3 3-LS4-4 3-LS1-1 3-LS3-2 4-LS1-1 4-ESS2-1 5-PS1-1 5-PS1-3 5-LS1-1 5-LS2-1
Food Preservation	3-5	Identify the properties of a jam or jelly, explain the cause of “weeping jelly,” identify the correct container for canning	Discuss the history of preservation; Make a jam or a jelly	4-PS3-2 5-PS1-2 5-PS1-3 5-PS1-4
Cold Frame Construction	3-5	Explain when and why a cold frame would be used in a garden	Design and construct a cold frame	3-ESS3-1 4-PS3-4 4-ESS2-1 4-ESS3-2 5-ESS2-1 3-5-ETS1-1 3-5-ETS1-1
Cold Hardy Vegetables	3-5	Understand properties of cold hardy plants, identify vegetable choices to grow in Alaska	Sort vegetables based on properties; Conclude which vegetables have the needed properties for Alaska climate; Design a garden that is optimum for Alaska	3-LS4-3 3-LS4-4 3-LS3-2 3-LS4-2 4-LS1-1 4-ESS2-1 5-LS2-1 3-5-ETS1-1 3-5-ETS1-2

Key: LS=Life Sciences, ESS= Earth and Space Sciences, PS=Physical Sciences, and ETS=Engineering, Technology, Applications of Science

Table 2 (continued).

Lesson Name	Grade Levels	Learning Goals	Activities	Science Standards
Making Butter	3-5	Explain and demonstrate the process of changing milk into butter	Record observations and weight, notice changes in state based on physical motion, discuss physical and chemical changes	4-PS3-2 5-PS1-2 5-PS1-3 5-PS1-4
Vermicomposting	3-5	Identify what can and cannot be composted by *Eisenia fetida* worms, explain the ecosystem and needs of worms,	Discuss living conditions of worms, create an ideal environment for worms, observe the importance of worms to soil	3-LS4-3 3-LS4-4 4-LS1-1 4-LS1-2 5-LS2-1 5-ESS2-1
Seeds	3-5	Explain what seeds need to grow, read a seed packet and understand the categories presented, correctly plant a seed	Planting seeds, review information on seed packets, discuss Alaska growing season, move through stations for plant markers, soil preparation, seed planting, and coloring	3-LS4-3 3-LS4-4 3-LS3-2 3-LS4-2 3-ESS2-1 3-ESS2-2 3-ESS3-1 4-LS1-1 5-LS1-1
Intro to Gardening	3-5	Explain the purpose and process of the Williwaw Garden Project, discuss the variety of edible plants (how they grow, why they're healthy)	Discuss the importance of gardening and healthy eating, learn about edible plants, decide which plants the class will grow, create a journal, color plant illustrations and discuss characteristics	3-LS3-2 3-LS4-2 4-LS1-1 5-ESS3-1
Sprouts	3-5	Identify the six main parts of a plant, explain how plants start from seed to sprout, give examples for each part of the plant that's eaten	Observe growth from seeds to sprouts, draw the sprouts in student journals, discuss basic needs of plants and root systems, draw a plant with main parts identified	3-LS1-1 3-LS3-2 4-LS1-1 5-PS1-3 5-LS1-1

Table 2 (continued).

Lesson Name	Grade Levels	Learning Goals	Activities	Science Standards
Tasting	3-5	Identify vegetables presented for tasting, discern the difference between local and shipped produce, explain individual preference for vegetables	Move through tasting stations set up with different vegetables, learn how vegetables are grown and typically consumed, write about tastings in a journal, present a case for which vegetables to plant in the school garden	None identified
Planting	3-5	Demonstrate the process of transplanting sprouts, explain how elements contribute to plant growth	Transplant sprouts into garden bed or plant seeds for direct seeding, learn how to use garden tools, examine planter boxes	3-LS3-2 3-LS4-2 4-ESS2-1 5-PS1-3 5-LS1-1
Fermentation (Note: The title of lesson appear to be misaligned with the lesson content.)	3-5	Learn about recycled art, apply the creative process in communication	Review examples of recycled art, discuss literature (*A Long Walk to Water),* brainstorm ideas of a recycled art show, propose success criteria	3-ESS2-2 4-ESS2-1 5-ESS3-1
Compost	3-5	Explain the decomposition process, understand and explain the method of making compost, list the key ingredients for decomposition	Choose perishable and non-perishable items for observation of decomposition, record contents and make predictions of decay process, identify location to keep the bags with decomposing items, observe items and state of decomposition after time	3-LS4-3 4-ESS2-1 5-PS1-3 5-LS1-1 5-LS2-1

7.5 Limitations and Strengths

Limitations of the review included its inability to capture a comprehensive compilation of thematic content from a broader swath of garden lesson plans developed by universities, school garden networks and agriculturally-based foundations. Such an endeavor would produce a significant volume of narrative data beyond the scope of this project. Each lesson had common components (e.g., objectives and materials) but there were also standalone elements that contributed to the uniqueness of each program. Furthermore, a number of the lesson plans reviewed during this project were self-submitted by programs to the Collective School Garden Network. This may be a repository of garden education, however, it is not an exhaustive resource since reviewable lesson plans were limited to programs who chose to be part of the network. The self-identification nature of the network inherently excluded many other school garden programs and curricula from this review. Lastly, of the lesson plans reviewed, there was no method for verifying if the content and activities had been reviewed and piloted by educators and collaborators.

Strengths of the project is the theoretical and practical connections made between place-based education, critical pedagogy, and school garden curricula. Structural considerations (i.e., academic standards and university partnerships) were explored and engagement visualized to support the more freeform learning of school gardens. The project was positioned as an inaugural exploration of how place-based education, critical pedagogy, and garden education can be applied to Alaska and the Circumpolar North. Furthermore, an effort was made to connect social justice as well make space for Indigenous ways of knowing in school garden curricula.

Chapter 8: Public Health Implications

8.1 Critical Pedagogy

Garden-based education has been linked to positive outcomes related to health, sustainability, and academic achievement (Cairns, 2018). However, there are far-reaching effects that go beyond individual outcomes captured as personal investment in food production and more nutritious food choices (Cairns, 2018). School gardens may lead to varying degrees of personal transformation, however, its collective impacts are observable in teachers who facilitate awareness of healthy actions and in students who learn empowerment of healthy choices. This promotion of awareness and empowerment is an overall concern of critical pedagogy. Furthermore, the hands-on experience of growing food not only provides literary education, but it also leads to discussions regarding inequitable access. These discussions provide opportunities for students to recognize their own circumstances and perhaps start to understand why food is not available to themselves and peers in the same way.

Van Ryzin et al. (2009) suggest that autonomy of learning and belonginess in the academic environment serve as cornerstones of student achievement. School gardens are positioned to contribute to academic performance by creating a space where students can feel a sense of belongingness that extends from an indoor classroom to an outdoor garden. This sense of belongingness is reinforced by a sense of academic freedom and encouraged by creativity in learning activities. Moreover, garden-based education recognizes the importance of communication and behaviors that promote inclusion of students with different socioeconomic backgrounds, thereby creating a space where the sociocultural norm is community over status. Thus teachers and

students alike are given an opportunity to become part of a community that is not marginalized by academics or economics. In essence, school gardens can lead to transformative change that engages teachers and students in reflecting on community action and in considering how they can improve the situation.

According to the CDC (2014), the third essential public health service is to "inform, educate, and empower people about health issues" (p. 10). Garden education has been linked to improved nutritional knowledge and healthy eating habits (Bell & Dyment, 2008; Somerset & Markwell, 2008). School gardens are positioned to help meet this essential service by strengthening the connection between children and the source of their food by creating hands-on interdisciplinary classrooms (USDA, 2017 para. 1). With childhood obesity and food access perennial challenges for public health, school gardens can contribute children's acknowledgement and autonomy. Literary education is upheld but children are also given an opportunity to grow their communication skills, teamwork, and leadership (Dillon et al., 2005). This personal transformation can contribute to and have a lasting impact on the collective concern for nutrition and healthy eating.

8.2 Place-Based Education

A tenet of place-based education (PBE) is hands-on, real-world learning experience that strengthens connections between students and academic achievement, community engagement, environmental sustainability, and civic action (Sobel, 2005). School gardens span the reach of PBE by having a positive impact on academic performance, environmental stewardship, and nutritious eating habits (Cairns, 2018). Most notably, in relation to PBE, is that garden education has been found to expand

ecological awareness and environmental responsibility (Lautenschlager & Smith, 2007; Skelly & Bradly, 2007). Thus gardening experiences expand the space where students learn by connecting the classroom to the outdoors and by connecting experience to place.

Previous research conducted with teachers has shown that school gardens are used to enhance the learning of students through promotion of experiential learning and teaching of environmental education (Skelly & Bradly, 2007). Moreover, there is also data that shows students participating in school gardens possessed a higher sense of responsibility and more positive environmental attitudes (Skelly & Bradly, 2007). More studies are needed to support correlation between school gardens and students' sense of responsibility, however, teachers using gardens have observed that gardening have the potential to foster such responsibility (Skelly & Bradly, 2007). Garden curriculum such as nurturing seeds, watering plants and overall caring for a garden may impact responsibility.

As mentioned earlier, a number of researchers have recognized the influence of garden education in supporting academic performance in various subject areas particularly science (Berezowitz et al., 2015). Teachers and researchers have recognized the importance of science education beginning with applications and connections to the real world (Skelly & Bradly, 2007). Furthermore, the gardening curriculum allows connection of science to multiple subjects such as social sciences, mathematics, nutrition, language, and art. Thus school gardens support the credo of place-based education to "…[use] the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and other

subjects across the curriculum" (Sobel, 2005, p. 335).

The role of place-based education in promoting environmental stewardship through a community-based program supports the fourth essential public health service: "mobilize community partnerships and action to identify and solve health problems" (CDC, 2014, p. 11). The development and management of a school garden program is dependent on formal and informal partnerships between students, teachers, school officials, researchers, community partners and volunteers—all acting as advocates for health improvement. Without a coalition of dedicated and engaged individuals, garden host sites can bear too great a responsibility and programs can fail. School garden programs thus identify and bring together essential constituents of education and advocacy, which can be further developed to include university partners that would progress research and action in a collective effort to improve health outcomes.

8.3 Social Justice

Garden education extends the boundaries of traditional curriculum and engages students who may face barriers in a traditional classroom setting. In a sense, this expansion of learning opportunities provides layers in which students can learn that is not bound by static outputs of ability and determined status of economy. The Edible Schoolyard Project (n.d.), identifies the possibility of garden curriculum to support social justice and dismantle oppressive systems. It has been proposed that school garden programs provide a means and an end in achieving equity (Edible Schoolyard Project, n.d.). In other words, creating an inclusive learning experience is a means to an end of producing food that acknowledges social justice.

Equity in terms of food is framed as food security, food sovereignty and health

outcomes. It can be measured in outcomes such as food allocation, dietary adequacy, and nutritional status (Harris-Fry et al., 2018). However, it has social impacts—especially when linked to socioeconomic status and race—that are richer and complex that is more challenging to quantify. The impacts are therefore captured by growing collective concern for healthy food and environmentally conscious practices which is partly evidenced by the range of educational initiatives that seek to provide children and youth with hands-on experience of growing food (Cairns, 2018). Equitable access to nutritious food is a struggle for poor minority communities, and it is in these neighborhoods that "community-based social movements are mobilizing around local food initiatives and redefining inequitable food systems as an issue of social justice" (Bleasdale, 2015, p. 6). Equity in food has become a conversation about production, distribution, and consumption, and is realized through initiatives that extend from school gardens to community gardens to urban farms.

Evans (2002) posits that justice-based movements are embedded within an "ecology of actors." Thus school garden programs are a collective effort of people and backed by multiple layers of institutions (i.e., communities, organizations, and governments). These "ecology of actors" must be deeply rooted in the community with the possibility of influence going beyond the bounds of the local network (Bleasdale, 2015). It is these wider impacts that can support equity and move social justice beyond where food initiatives are active. In other words, "social justice, then, is not to be found by simply changing the scale at which the food system operates" (Bleasdale, 2015, p. 40).

The fifth essential public health service is to "develop policies and plans to that

support individual and community health efforts" (CDC, 2014, p. 12). Individual agency and community resources must be aligned for successful development and management of school gardens. The community-based programming and action of school gardens has the potential to be a vehicle for systematic change that frames food-related social justice as issues of race, social class, equality and access to healthy food (Bleasdale, 2015). School garden programs support individual and community efforts through a strategy that reinforces literary education, social movement, and environmental sustainability that is connected to health outcomes.

Chapter 9: Conclusions and Recommendations

9.1 Community Partnerships

School garden programs can provide a collective voice and serve as community action for knowledge- and responsibility-sharing of issues related to food equity, activism, and stewardship. This cannot be done without dedicated supporters who provide expertise, labor, funding, resources, and guidance. The rich learning experience of school gardens has room for more helping hands. Besides strengthening connections with existing stakeholders (i.e., students, school, family, community, and governmental institutions), there is potential to expand the network to university partnerships.

In an effort to engage university students in school garden programs, school districts, school garden support organizations and universities must be involved from the initial planning stages to the active operational stages. Developing a program is inclusive of four steps: 1) identifying schools and garden programs, 2) designing a university internship course, 3) establishing service learning and mentorship, and 4) assessing the school-university partnership. However, this process is nonlinear in that

each step branches to other considerations (e.g., determining how many credits for a course and where to place a course in the degree sequencing). While the local knowledge of stakeholders is critical in the planning process, case studies can support the effort. The University of California has several garden education programs that could guide decisions (i.e., UC Davis Student Farm, Watsonville School Garden Program, and Berkeley Unified School District Garden and Nutrition Program). By reviewing case studies, a toolkit can be developed to summarize common elements of different school garden programs and steps can be set in chronological order to create a structured pathway.

The School and Garden Workshop Course with the University of Arizona is a workshop-based course that is designed to engage university students to work in local schools helping students and teachers to implement a school garden program. Service learning is at the core of the workshop course, embedding university students in local schools and facilitating community learning. It is shaped by instruction through the lens of higher education with practice of environmental sustainability and collective action. Thus this framework is guided by student academic performance and engagement as well as experiential learning that promotes responsibility and attitudes toward local and global systems. The lessons learned and best practices from a review of the University of Arizona course as well as case studies can provide touchstones for developing a partnership between universities and schools.

9.11 Developing a University Internship Course

As school gardens are challenged by the planning and management of programs, colleges and universities are looking for experiential learning opportunities for

its students. The inclusion of university students into garden education and programming can create a mutually beneficial partnership of community support for schools and educational engagement from universities. The culmination of program planning for a university garden internship course should provide an artifact such as syllabus (see Appendix A). This project has recommended a syllabus to serve as a template for the instructors of the course. It includes basic elements that are critical for student orientation (e.g., course policies) with the inclusion of developing elements that are supportive of students (e.g., resources for health and counseling). The syllabus should be customized to capture the instructor's pedagogical practice and teaching philosophies as well as university course performance metrics and department syllabus requirements. Notes to guide instructors are italicized.

9.2 School Garden Curriculum

Garden education provides a unique opportunity whereby lesson plans are a collaboration between teachers and researchers, community members and families. There is no shortage of garden curricula that are freely shared between universities, school garden networks, and agriculturally-based education foundations. With the growth of garden education initiatives there was a rise—though somewhat delayed—in lesson plans that were based in academic standards. Such a model would allow for a stronger connection between academic instruction and garden curriculum. Thus garden lesson plans can be tied to the sequence of students' learning in an academic classroom.

The Williwaw Elementary garden project utilizes lesson plans created by the school, NeighborWorks Alaska, and the Civics Eat Initiative at the University of Alaska

Anchorage. This collaboration can be representative of the initial stages of the “Locate and Contribute to Domain Knowledge” of the LAC. Since the inception of the Williwaw garden project, teachers and students alike have used the lesson plans to facilitate the “Present” stage of the LAC as their participating in garden activities. The lesson plans further contribute to the “Create and Explore” stages of the LAC where students conduct activities in the lesson plans and think about how the topics relate to their own experiences and beyond. While the Williwaw garden project lesson plans and its students have completed the course of the LAC, “Reevaluation” is at the core of the cycle. To this end, the garden lesson plans are primed to undergo another orbit around the cycle with the goals of revisions and further curriculum development.

As mentioned earlier, school garden programs should support the efforts of teachers and the academic lives of students. By connecting garden curriculum to academic standards, a stronger connection can be made between traditional classroom methods and place-based education. In its current iteration, the Williwaw garden lesson plans are not connected to academic standards. This project attempted to connect current lessons to the Science Standards of Alaska and provided a lesson plan template (see Appendix B).

Key to the lesson revision process is seeking collaborative feedback from a variety of sources: nutrition teachers for kitchen lessons; agriculture educators for garden lessons, along with academic classroom teachers and community members. Critical thinking is necessary for 1) identifying and defining lesson goals, 2) developing student learning objectives, and 3) considering food, crop and activities. As proposed in this project, garden education is poised to identify ways that its foundations can work to

cultivate social justice and dismantle oppressive systems. This is not an easy task, but the goal is not to create an educational experience that is either wholly anti-oppression curriculum or wholly building academic skills. The objective is to hit one or two considerations and not dilute the core and impact of garden lessons. The guiding principles of the Edible Schoolyard Curriculum Discussion Tool matches these essential concepts and in turn can be used to guide the revision of the gardening lesson plans. To start, the collection of lessons can be assessed against the priorities listed in the Curriculum Discussion Tool. An example process could be to read through the current lessons, each author fill out the Curriculum Discussion Tool, and then the reviewers meet to discuss their assessments.

9.21 Developing Garden Lesson Plans

Each garden lesson should be connected to the arc of students' development over the school year: knowledge, skills and behaviors. In turn, this arc can be further aligned with development of the garden over the seasons: fall, winter, spring and summer. It is especially important to work with teachers on the endeavor of connecting garden lesson plans to their expected academic frameworks and pedagogical practice. This project's recommendation of lesson-standards alignment should be reviewed, discussed and vetted by domain experts such as teachers and researchers who are the authors of the original lesson plans (i.e., Williwaw Elementary, NeighborWorks Alaska, and the Civics Eat Initiative). Furthermore, lesson plans can be presented in a sequence, when appropriate, where the activity is correlated to timing (i.e., teach the Seeds lesson plan during winter). This scaffolding can lead to a culminating lesson of the year. Lastly, effort should be made to include family activities in the garden lessons.

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Appendix A: School Garden Lesson Plan Template

WILLIWAW GARDEN PROJECT

INTRO TO GARDENING

This lesson plan was developed by Williwaw Elementary, NeighborWorks Alaska, and the Civic Eats Initiative at the Center for Community Engagement and Learning (CCEL) at the University of Alaska Anchorage

SUBJECT/COURSE	GRADES	SCIENCE CONTENT STANDARDS
Garden Education Healthy Eating	3-5	3-LS3-2 3-LS4-2 4-LS1-1 5-ESS3-1
TOPICS	**LESSON LENGTH**	**INTERDISCIPLINARY**
Plant Selection Getting Started	1 Hour	Arts Skills for a Healthy Life

INTRODUCTION

The Williwaw Garden Project is comprised of monthly, hands-on gardening and nutrition lessons, designed to foster a sense of self-efficacy around growing and eating healthy foods. This pilot project begins with student selection of garden plants and other foundational activities (i.e., the focus of this lesson). It later culminates in a school-wide planting party that results in a beautiful outdoor garden for community use during the summer months.

LEARNING GOALS

By the end of this lesson students will be able to:

- Explain the purpose and process of the Williwaw Garden Project
- Discuss a variety of edible garden plants -- how they grow; why they are healthy; and topic areas they'd like to learn more about

Appendix A (continued)

INTRO TO GARDENING

EXTENSION IDEA

The second illustration colored by each student can be used to decorate the school halls and generate additional excitement around the school garden project.

COMMUNITY ENGAGEMENT

Teachers may wish to invite parents or community partners to assist in the delivery of the lesson, and/or facilitate additional nuanced discussions. Examples may include Cooperative Extension agents, local botanical garden employees, and artists.

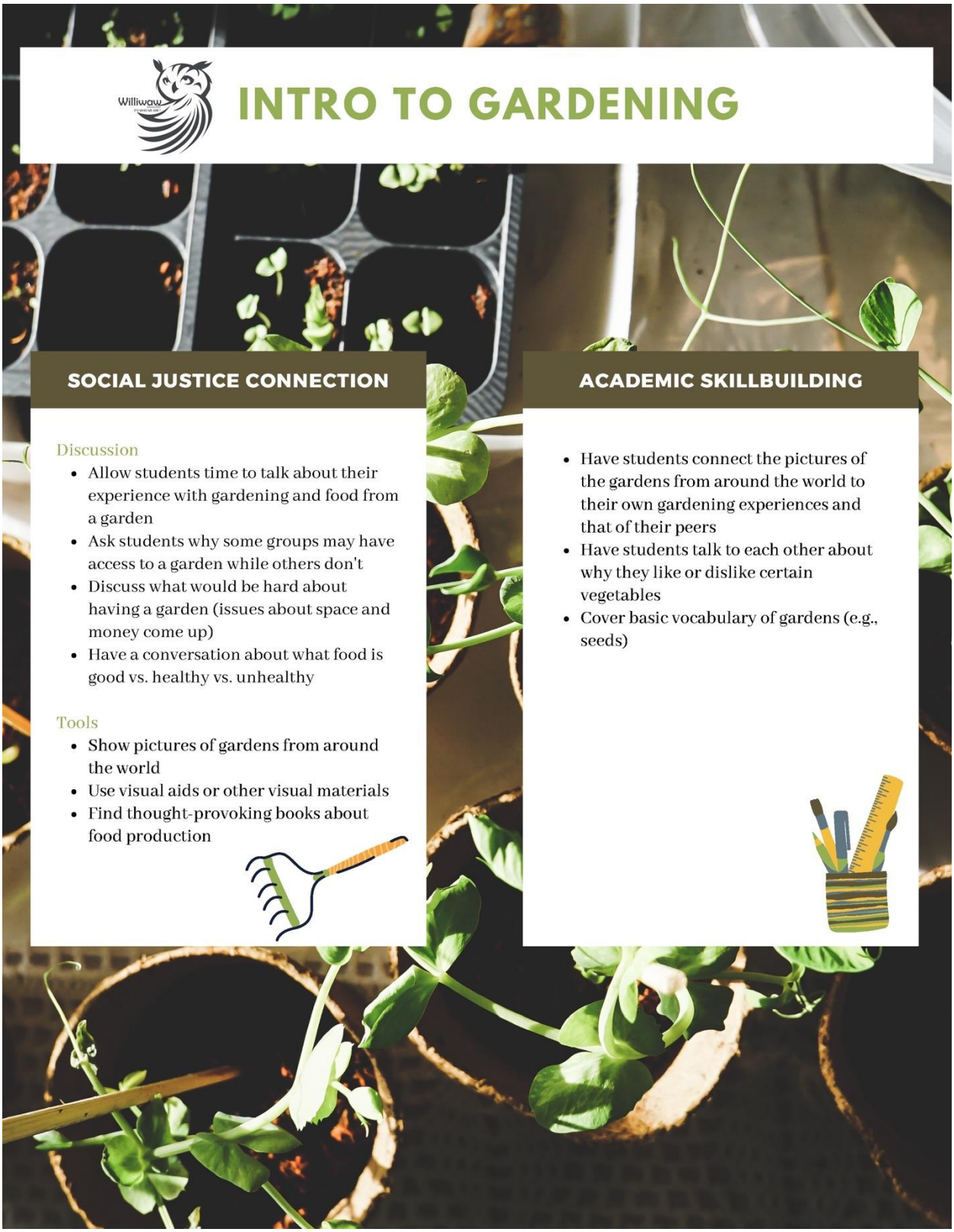
RESOURCES

1. Alaska Ag in the Classroom: https://www.fairbankssoilwater.org/education-agriculture-classroom.htm
2. University of Arizona Community and School Garden Program: https://schoolgardens.arizona.edu/

INSTRUCTIONS

1. Introduce the concept of the Williwaw Garden Project to your students (see Introduction/Objectives). Share with your students that today is focused on: 1.) discussing the importance of gardening skills and healthy eating, 2.) learning about a variety of edible garden plants, 3.) voting on which plant each grade will grow, and 4.) creating a journal that they will use to log their thoughts after each monthly lesson.
2. Administer the brief pre-test.
3. After your students have completed the pre-test, copy the questions onto a classroom board or poster, and spend a few minutes discussing the questions and their answers as a group.
4. Make the copies of the garden plant illustrations available to your students, instructing that they may each select two to color realistically or imaginatively. Instruct students to then surround their illustration with words describing how growing their own food and eating healthy makes them feel. You may wish to display colored versions of the illustrations or pictures of the actual plants to guide your students.
5. Share with your students that the illustrations will be used to create their journals.
6. As your students color, you can use the time to talk about each plant. What does it look like? Where does it like to grow? What does it taste like? What nutrients does it provide? What dishes can be made from it?
7. Instruct the students in the creation of their journal, using one of their colored illustrations as the cover.
8. Once their journals are bound, direct your students to reflect upon the day's activities. What was one new thing they learned? What was one especially surprising new thing they learned? What can they say about each of the plants discussed? How do they feel about the prospect of growing their own food? What would they like to learn more about?

Appendix A (continued)



Appendix B: University Internship Course Syllabus

COURSE DESCRIPTION

The UAA Student Internship Program course will lay the groundwork for creating a connection between the university and Williwaw Elementary to support a student-to-student learning model. This internship-based course will enable undergraduate and graduate students to partner with Williwaw Elementary to help its students and teachers develop and manage a school garden program. University students will take part in an experiential learning opportunity to gain skills in teaching, health promotion, and program management. Students will be exposed to a breadth of practical experience---from constructing garden beds to developing curriculum to harvesting vegetables. There will also be an opportunity for theoretical experience by learning and teaching about critical topics such as food production, food histories, and food politics.

The Williwaw Garden Project is a collaboration between NeighborWorks Alaska and Williwaw Elementary School. The overall project goal is to develop and expand garden-based curriculum for Alaska schools. It is supported by the UAA Center for Community Engagement and Learning and the Anchorage Municipal Local Food Mini-Grant. The mission of the Williwaw Garden Project is to create a rich learning environment where students can learn about vegetables and gain experience with growing. This learning will enable students to 1) learn about healthy eating, 2) practice environmental stewardship, and 3) find a connection to academic performance.

CLASS MEETINGS

Location (virtual link or in-person), Days/times of meetings (if applicable) and field work at Williwaw Elementary

Appendix B (continued)

A garden requires patient labor and attention. Plants do not grow merely to satisfy ambitions or to fulfill good intentions. They thrive because someone expended effort on them.
-Liberty Hyde Bailey

COURSE GOALS

- Students will act as ambassadors of health and education
- Students will practice civic engagement
- Students will participate in experiential learning opportunities
- Students will gain understanding in how to use a garden as an educational tool
- Students will support the development and maintenance of a school garden and guiding curriculum
- Students will learn to asses their choices as educators

STUDENT LEARNING OUTCOMES

- Students will be able to design, construct, plant, harvest and prepare foods from a local school garden
- Students will be able to prepare and assemble curriculum materials to facilitate learning about food production, histories, and politics
- Students will be able to facilitate learning in and out of a classroom by providing instructional support to students by reinforcing teachers' goals and garden lesson plans

INSTRUCTOR INFORMATION

- Name
- Email & phone
- Office hours & location
- Statement about availability to students

Include contact information collaborators at Williwaw Elementary

COURSE READINGS/MATERIALS

Course textbook title, author, edition/publisher, ISBN. Supplementary readings (indicate whether required or recommended) and any supplies required, including subscription to a particular publication or tool. Consider linking here to the course schedule, particularly if readings are posted there. Consider linking to the schedule of Williwaw Garden Project lesson plans

TECHNICAL REQUIREMENTS FOR COURSE

Describe the technical requirements for the course, especially if you are using technology beyond the basics of Blackboard.

You'll need regular access to a computer and the Internet to access our course materials.

Please spend some time familiarizing yourself with our course website in [*name LMS here such as Blackboard*]. You will need to be able to download and upload documents, watch and create videos. UAA students can get technical help here.

INSTRUCTIONAL METHODS

Experiential learning: emphasis is placed on the experience itself and the opportunity to reflect on that experience and integrate new skills and knowledge
Mentorship: build strong relationships between the university and community
Peer-to-peer learning: connect with peers who are also in the program and receive perspective and guidance facilitated by a cohort model

Appendix B (continued)

COURSE POLICIES

A general statement about expectations of both the rights and responsibilities of anyone participating in the class (students, instructors, community partners, etc.).

The policies that guide this class are rooted in an expectation of respect. Our classroom is an experimental space: we're all learning, and this requires that we ask questions, try out new ideas, take risks, fail, and come to new insights individually and together. You are encouraged to experiment with your ideas, with your writing, and with your citizenship as part of our classroom community. You are expected, also, to offer patience, attention, and respect to your classmates as they test new ideas.

Attendance

State if this is a synchronous or asynchronous course. If it is the latter, revise this to discuss student "presence" in the course with links. If you are required to participate in (a) military, (b) UAA-sponsored activities, (c) documentable medical leave, or (d) participation in cultural activities that will cause you to miss a class, you must notify your instructor as soon as possible. You must inform your instructor of all scheduled UAA-required absences for the semester (e.g., travel to athletic events) during the first week of classes.

Academic Integrity

Your academic honesty is assumed, which means that I expect all of your submitted work to have come from your brain and your hand. If you've submitted the work of someone else, in whole or in part and without proper citation, I will not accept the assignment. Within academic communities, plagiarism represents a serious breach of trust and can carry severe consequences, including disciplinary action. With that in mind, we'll go over the proper ways of summarizing, paraphrasing, quoting, and citing your materials so you can avoid pilfering information, even accidentally.

Late Work & Revision

State course policy for accepting late work including cutoff days and percent deductions, if appropriate. Resubmission of assignments may become available at the instructor's discretion. If you have a personal emergency, contact the instructor as soon as possible.

Instructor Response Time

State how much time for returning a direct contact such as email (generally, right away or within 24 hours) and how much time for returning graded material (best within 48 hours after assignment due date but no longer than a week).

SUPPORT SERVICES

Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

UAA eLearning & Distance Student Services

If the course is online, include information about the services offered by the UAA eLearning department including student services, contact information and a link to their website.

Appendix B (continued)

Information Technology Services

Go to the department website to see about current network outages and news. Reach the Help Desk at:

- e-mail: uaa.techsupport@alaska.edu
- phone: 907-786-4646 (in the Anchorage area) or 877-633-3888 (outside of Anchorage)

UAA/APU Consortium Library

The Consortium Library reference help desk is available to assist students with library research and other questions.

UAA Learning Commons

The UAA Learning Commons provides student-focused support such as writing, math and science tutoring as well as academic and communication skills coaching. Services are available on campus and online.

Disabilities Services

The UAA Office of Disability Services provides academic accommodations to enrolled students who are identified as being eligible for these services. If you believe you are eligible, please visit their website or contact a student affairs staff person at your local campus. You can also contact Disability Services on the Anchorage campus by phone, 907.786.4530, or by email (uaa_dss@alaska.edu)

Health & Counseling Center

The counseling center provides counseling, consulting, outreach and health education . View their services and schedule an appointment on their website.

Care Team

Student well-being and safety is addressed through coordination of service and support plans. A care report can be submitted to the team to initiate outreach efforts.

GRADING

Include a table to show how students' grades will be calculated

Activity/Assignment	% grade	Due Date
Participation (attendance, discussion, peer review)	%	ongoing
Service learning (engagement, self-reflections, teacher assessment)	%	ongoing
Micro-writing assignments (# throughout semester)	%	ongoing
Major project 1 (including outline, first draft, and peer review)	%	TBD
Group/individual capstone project (including plan, memos, presentation)	%	TBD

Appendix B (continued)

EVALUATION POLICIES

Specify how students will be evaluated, what factors will be included, their relative value, whether and which evaluation elements are proctored, and how they will be tabulated into grades (on a curve, absolute scores, etc.)

Include language about audit policy and NB/I/W grades.

Include grading schema of letter grades (A, B, D, F) and whether or not +/- (plus/minus) is used.

Consider how you are assessing and weighing assessments of students.

How to check your grade:

State where and how students can view their grades and feedback given. Sample directions for checking grades in Blackboard is noted below.

To check your grades for assignments and find comments from your instructor, click on the My Grades link in the sidebar menu. All the assignments and their due dates are listed. If your instructor has left comments, there will be a Comments link. Click on this link to view comments.

If the score is for a test or quiz, click on the check mark or your score to see results and feedback.

If the score is for an assignment, the title of the assignment is a link and by clicking this link you'll be taken to your submission, grade and comments.

If you see a green exclamation point, your assignment has not been graded yet.

EFFORT AND STUDENT INVOLVEMENT

Illustrate where student effort goes by percentage

of effort into four categories. These categories will demonstrate how the # hours of lecture and # hours of non-lecture in the field.

Students should look forward to an average of # hours per week for this # credit course.

1. **INSTRUCTION:** *(lectures, readings, teacher-student conferences) %*
2. **INDIVIDUAL RESEARCH** *(individual research for papers, projects) %*
3. **ASSIGNMENTS** *(actual projects and assessments) %*
4. **COLLABORATION** *(discussion, groups projects) %*

EXPECTATION OF STUDENT EFFORT

State expected number of hours per week a student should be prepared to spend, etc.

Students should expect to spend # hours per week on this class including field work at the school. If circumstances arise that cause you to need extra time on any assignment(s), email me. Extensions may be granted, but your instructor expects to be informed in advance if you are not able to submit your assignment on time. Students are expected to maintain a working backup plan to be implemented in the event of a computer malfunction or an interruption of their normal Internet.

Include information and guidelines about written and oral communication, student behavior, and writing standards and etiquette.

Appendix B (continued)

TITLE IX PROTECTION

University of Alaska Board of Regents have clearly stated in BOR Policy that discrimination, harassment and violence will not be tolerated on any campus of the University of Alaska If you believe you are experiencing discrimination or any form of harassment including sexual harassment/misconduct/assault, you are encouraged to report that behavior. If you report to a faculty member or any university employee, they must notify the UAA Title IX Coordinator about the basic facts of the incident.

Your choices for reporting include:

1. You may access confidential counseling by contacting the UAA Health & Counseling Center at 907-786-4050;
2. You may access support and file a Title IX report by contacting the UAA Title IX Coordinator at 907-786-0818;
3. You may file a criminal complaint by contacting the University Police Department at 907-786-1120.

COURSE SCHEDULE

Give students an overview of the course and the plan from the start. Use a calendar-style schedule or a list. Append it to the end of the syllabus or keep it as a separate document.

To plant a garden is to believe in tomorrow.
-Audrey Hepburn